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Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science

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Bartlett's Patent "Illuminating" Street Lamps.

There has been but little change or improvement in the ordinary street lamp for gas, since it first made its appearance, at a period nearly equal in point of time, with the introduction of gas itself. The multiplicity of leaky and rattling panes, with the large outlay in tin trappings, and complicated and elaborate chimney or flue, and capping, are all ancient and out of character, when compared with the various neat and tasteful modern improvements which have been made in almost every other kind of gas apparatus; and especially the various gas fixtures and appliances which serve to ornament and illuminate the interior of our public buildings and private dwellings.

The street lamp illustrated herewith, seems to be quite a radical change from the old style. It might be called the Crystal street lamp, inasmuch as it is made entirely of glass; in form it is not unlike a small balloon, surmounted with a parachute or reflector, which is placed directly above the globe upon the ventilator, as fully represented in the engraving.

Three iron rods or standards rise from the top of the post, surmounted and connected with a metallic ring or band. The lamp has a flange which rests upon this ring to support it. Letters and numbers of streets are cut out of this band like stencil work, and the light shining through, serves to illuminate them.

The appearance of this lamp is unique and pleasing to the eye. It gives free passage to the light, and with the reflector, increases the light of the lamp compared with the old style, very materially, and is evidently a very complete, simple, and effective street lamp.

The lamp is open at the bottom to admit the use of Bartlett's Improved Torch and Key for lighting street lamps instantaneously, without the use of a ladder, etc.

These lamps may be seen in constant use at the Fair of the American Institute, also in front of A. T. Stewart's on Broadway, between 9th and 10th streets, 5th Avenue Hotel, corner 23rd street, Astor House, St. Nicholas, and Metropolitan Hotels, and in various other places.

Further information can be had of J. W. Bartlett, patentee, 569 Broadway, N. Y.

Petroleum in Illinois.

By far the most valuable observations, in that they interest nearly every class in an educated country, were the following by Dr. Hunt, the distinguished Canadian geologist, and President of the Association, concerning the petroleum deposits of the Northwest, especially in the vicinity of Chicago.

Petroleum, Dr. Hunt proves to be indegenous to certain limestones, not, however, entering into them, as is sometimes stated, by distillation from neighboring schists; these schists have not been subject to great heat, and the petroleum limestone often lies far below such formations. The oil is usually found in patches and bands, with strata above and below containing no oil. The oil is hermetrically sealed in the pores of the

BARTLETT'S PATENT "ILLUMINATING" STREET LAMP.

limestone and escapes only on lines of disturbance, again accumulating in fissures, or on overlying strata Near Chicago there is true limestone of the Niagara formation, 35 to 40 feet thick, filled with oil and really containing nearly half its weight in oil; every square mile has 7¼ million barrels of real petroleum.

As Pennsylvania in ten years yielded 28,000 barrels of oil, it follows that within four square miles of the Chicago limestone, there is more oil than has been obtained altogether in ten years in Pennsylvania. However, this oil is not obtainable, as it does not appear with pools that force it out in spouts in other places where its collection has been a success. The whole secret is that heat is vitally necessary to the separation of oil and its absorbent rocks.

In relation to this subject, Prof. Newberry bore testimony to the general accuracy of the conclusion of Dr. Hunt, but his experience warned him to regard limestone as by no means the only source of oil—in fact stratified bituminous shales, that so largely abound with Palæozoic rock, holds oil, and yield it liberally. Some of this in Pennsylvania, too, is of unquestionable animal origin. In that State bituminous shales underlie all the productive oil wells, separated hundreds of feet from the limestone, which is besides impervious. These shales yield oil spontaneously, and over all of them are sandstones, allowing easy escape. The practical work of oil getting is largely indebted to these investigations for success in boring and the present discoveries are no less important than preceding ones.

Continuing this interesting discussion, Dr. Hall, the eminent geologist of our State, averred that 200 miles of limestone, of the Niagara group in this State, upon being tested yielded drops of petroleum, and when exposed to heat the oil would run out in streams. A specimen from Block creek, now in the State Museum at Albany, has been dripping with petroleum for thirty years. From the Marcellus shale, and that of Genesee, Portage, and Chemung, there are constant emissions of inflammable gas in prodigious quantities, and an escape of petroleum in small quantities. In none o these localities, however, are there any productive oil wells. The outcrop is nearly on a plane, or without undulations or apex, and on this account the Doctor had always discouraged boring wells along these hills, although it is certain that, had the country originally been disturbed so as to produce some interclinal flextures where the slowly oozing oil could have accumulated, there would now be numberless productive wells in that part of the State.—*N. Y. Railroad and Mining Register.*

The Director of the Saline works in Austria, Ed. Windakiewiez, has introduced kerosene lamps in the mines, on account of their much greater luminosity when compared with candles, or the common smoky oil lamps. He found that a good kerosene lamp, containing four ounces of petroleum, was as effective as five lamps, containing each three ounces of rapeseed oil.

It is said that the petroleum bill pending in the House of Lords, if passed, will prove almost fatal to the traffic.

Chemical Repertory.--No. 38.

OCTOBER 3, 1870.

Editor—HENRY WURTZ.

Editorial.

AIR IN GAS—EXHAUSTERS.

In our issue of July 16, there was an interesting and valuable communication from Mr. STIMPSON, the Gas-Inspector of Massachusetts, on the above subject, to which was appended by the Editor a promise of some special discussion of the question at an early day. Repeated absences from the city since then, however, on professional and other business, have interfered greatly with this and other plans connected with the Journal. To-day we have another communication from another correspondent, on the same topic; and we hope the subject may be agitated through our columns until some new lights are thrown upon it. That the assumed great benefit conferred by the use of the Exhauster is *in many cases* at least partially due to the induction of air into the gas, and is therefore actually a benefit of a negative kind (certainly to the consumer), has long been more than suspected by the present writer; though he is far from being at present prepared actually to impugn the theory, now traditional, regarding the action of the exhaust, that is of a possible the diminution of pressure, diminishing the loss of gas through secondary decomposition after evolution, as generally believed to be demonstrated by the disappearance of the carbon incrustation under the influence of the Exhauster. Nevertheless the writer cannot refrain from saying that he would be far better satisfied of the actuality of the view ordinarily accepted were he aware of any reliable experimental determinations of the actual degrees of pressure extant in a retort, *ceteris paribus*, when the exhaust is on and off. The suggestion of our correspondent of to-day, that air may be drawn in through the mouth pieces, seems certainly a legitimate subject for experimental inquiry, though it is hard to believe that such could be the case during the evolution of the gas from the charge. If the "two or three months past" spoken of were those immediately precedent to the date of our correspondent's letter, September 10th, we might suggest to him the absence of complete knowledge of the details of the case, the customary decrease of consumption during the short summer evenings. It is much to be hoped that our correspondent will enlighten us further as to all the circumstances, and that others may also take up the ball, and keep it rolling until the Exhauster question, if possible, is itself exhausted.—H. W.

American Chemical News.

ANTHRACENE AND ALIZARINE.

GRAEBE and LIEBERMANN have published a resumé of their investigations during the past two years upon anthracene and alizarine and their derivatives. Our first knowledge of anthracene came from an investigation made by DUMAS and LAURENT in the year 1832, in which they discovered a hydrocarbon of especial interest in the denser part of coal tar. They obtained for it the formula $C_{30}H_{12}$, and since this is 1½ as high as that of naphthaline, they named their hydrocarbon paranaphline. Later, LAURENT gave it the name anthracene, because a great number of hydrocarbons, polymeres of naphthaline, may exist in coal tar, to all of which the common term paranaphthaline might properly be applied. In 1857, FRITZSCHE described a hydrocarbon of high boiling point arising from tar, of the constitution $C_{28}H_{10}$. He drew attention to the fact that this compound, in many respects, was similar to LAURENT's anthracene. By the investigations of other chemists, this identity has been fully established.

ANDERSON and BERTHELOT have made known in full in what manner pure anthracene may be obtained from the dense portions of tar by repeated distillation, pressure, recrystallization from benzine and sublimation. But anthracene in tolerable purity will soon be an article of commerce. In this case, if the anthracene, supposing it to have been already freed from oil, has not its proper melting point of 210 deg. to 213 deg. it must be recrystallized from benzine until it melts at this temperature. The anthracene thus obtained, is in crystals, to which a bright yellow coloration so tenaciously clings that they cannot be rendered fully white by recrystallization. They can be freed of this yellow tint, however, by two methods—by sublimation at the lowest possible temperature and subsequent washing with ether; or by bleaching a solution of anthracene in hot benzine by direct sunlight. In the last case the anthracene separates on cooling in colorless crystals, of a superb blue florescence. This last method has the disadvantage that the anthracene can easily become mixed with paranthracene. These crystals are tubular, smaller or larger according to the degree of purity, and belong to he monoclinic system. If colored at all yellow—the coloring substance is crysogene—the beautiful blue florescence above alluded to, is not seen upon them. Anthracene is soluble with difficulty in alcohol and ether, easily in boiling benzine. It melts at 213 deg., and distils at 360 deg. Sublimation, however, in small leaves, takes place before the temperature has reached the melting point. The behaviour of anthracene towards reducing agents, towards bromine, chlorine, and oxidizing substances is given in great detail. The same chemists have effected the reduction of alizarine, by means of a great excess of zinc filings, in a combustion tube. The hydrocarbon thus obtained agrees in all its properties with anthracene.—*Jour. Franklin Institute.*

PREPARATION OF ANTHRACENE.

Dr. J. GRESERT—That portion of the distillatihn of coal-tar commonly called green grease, and used as wagon and cart-grease, is, according to the author, the material of coal-tar which contains anthracene, and consists chiefly of a heavy oil, naphthaline, and about 20 per cent. of anthracene, which, however, is only contained in coal tar to an amount of from ¾ to 1 per cent. This semi fluid grease is first placed in a centrifugal machine, in order to expel, mechanically, as much as possible of the oil; the residue is heated to 40 deg., and pressed preferably between hot plates. The cake thus obtained (crude anthracene, containing 60 per cent. of that substance) is purified by boiling with light tar-oil (coal tar naphtha), or with petroleum naphtha. The pasty mass is again placed in the centrifugal machine, to remove the last traces of heavy oil, and the material next submitted to sublimation. In order to test the green grease for the quantity of anthracene from 5 to 10 grms of that substance are taken, placed between folds of filtering paper, and pressed between hot plates; the remainder of the substance is repeatedly boiled with cold alcohol upon a filter, and next dried and weighed. The fusion point of the mass should be as near as possible 210 deg. The author says that sulphide of carbon is not well suited for the purification of anthracene, because that substance is too readily soluble in that fluid. One hundred parts of alcohol dissolve, when cold, 0.6 parts of anthracene; and 100 parts of sulphide of carbon dissolve 1.7 parts of anthracene.—*Ibid.*

PROCEEDINGS OF THE BRITISH ASSOCIATION OF GAS MANAGERS.

ON THE ECONOMICAL PURIFICATION OF COAL GAS.

Having been requested to write a paper for this meeting, I think that one of the most important subjects to which I can call your attention is that of "The Economical Purification of Coal Gas." It is well known that for many years past gas companies in large towns have been compelled to abandon the use of wet lime purification, owing to the great difficulty of getting rid of the "blue billy," as it was called, and in order to overcome this difficulty dry lime purification was commenced, but in a very few years the inhabitants surrounding gas establishments made such serious complaints as caused gas companies to look out for some other material which would remove the nuisance complained of; and it was shortly after this date that the oxide of iron purification became general. This last plan gives no cause of complaint, but it is, nevertheless, a more expensive plan than the old wet lime purification, and at the same time, if only the oxide be used, it does not purify the gas from carbonic acid. Now, if this last named impurity be present in the gas it destroys to some extent the illuminating power, so I think it is evident that if some plan could be adopted to overcome, or considerably lessen the expense of either dry lime or oxide of iron purification, and at the same time render the gas free both from sulphuretted hydrogen and carbonic acid, a great point would be gained. My object in calling attention to this matter is that, having been invited to inspect a plan lately invented by Mr. F. C. Hills, of Deptford, I felt that a description of that plan might be useful to some of the members of this association, and I am thus induced to lay before the meeting a few facts relating to this important subject. It has been long known that caustic ammonia will purify coal gas, but no plan has hitherto been found by which liquid ammonia could be obtained of sufficient purity and cheapness to purify gas until Mr. Hills made the way clear. The plan he adopts is to make the ammoniacal liquor produced at gas works of sufficient purity to become a cheap and effective purifying agent for depriving gas of its sulphuretted hydrogen and carbonic acid. The gas liquor being made on the works is always ready for use, and when purified by the process hereafter described, is run through the common scrubber, and the gas allowed (in the usual way) to pass up through the scrubber. It then comes in contact with purified ammoniacal liquor, which deprives it of its impurities, and thus the desired result is obtained and all expense of excessive labor is put to an end.

The mode Mr. Hills employs to purify the gas liquor is as follows: He uses a series of stills or vessels placed one above another, which vessels are partly filled with the gas liquor to be purified. The gas liquor runs through these vessels by means of connecting pipes from the top to the bottom. In the bottom vessel the gas liquor is caused to boil. By this boiling the carbonic acid and sulphuretted hydrogen, in combination with the gas liquor, are driven off to a great extent, and also a little ammonia; these products are caused to pass into the liquor in the next vessel above, by which the ammonia vapor is mostly absorbed, but not the carbonic acid or sulphuretted hydrogen, and, by passing these products in like manner through the whole series of vessels, the ammoniacal vapor driven off from the boiling gas liquor is absorbed by the gas liquor in the higher vessels, and the carbonic acid and sulphuretted hydrogen are left free to pass away wherever desired. The hot purified gas liquor as it runs out, heats the cold gas liquor which is to be purified by passing in opposite directions through a series of pipes, so that very little heat is required for purifying the gas liquor. If wished, the whole of the gas may be purified entirely by this gas liquor, but as the quantity required would be considerable it is perhaps best to purify the gas about two thirds by this process, and then to finish the purification with oxide of iron. When the purification of gas is effected by means of liquid in scrubbers, it becomes of great importance to secure a good spreader of the liquid over the surface of the media contained in the scrubber. Mr. Hills has contrived a new spreader, by means of which the liquid to be used can be caused to spread quite evenly, and in the exact proportion required, over every part of the surface of the media contained in the scrubber, so that no one part shall have a greater proportion of purifying liquid than another. By this means a minimum quantity of liquor can be made to do its maximum quantity of work.

It thus appears that the present plan promises all the advantages of the old wet purification, whilst at the same time the products of the improved method are valuable, and will pay for their removal, and, in addition, be a source of profit to the gas company. It is simple in operation, and the gas manufacturer has at his own command the purifying agent required.

I may add that this plan is now being experimented upon by Mr. George Livesey, who was the inventor of a plan somewhat similar to that now described.

As to the surface required, it is expected that the present scrubber surface at the South Metropolitan Gas Works will be sufficient to purify the gas made at those works, so that in adopting Mr. Hill's new plan no additional expense will be incurred at that station in purifying surface.

BRITISH COAL MINES.

The following items are selected from the Reports of the Government Inspector of (British) Coal Mines for 1869, just published this summer:

CONNECTION OF STORMS AND EXPLOSIONS.—In two previous reports Mr. BROUGH made mention of certain natural occurrances witnessed after the autumnal equinox in the years 1866, 1867, 1868, and he suggested that as some of our annual groups of accidents were coincident in time, that they might have relation the one with the other. The probability of any such sort of connection may be very remote indeed, or really and truly it may not exist at all. Nevertheless, the periodicity of earthquake, storm, and explosion in coal mines having manifested itself in the fall of the year 1869, it becomes impossible that such recurring phenomena should escape observation and remark. The investigations of the present century have, to a certain extent, taught us that during and after earthquake the undulation of earth waves stretch far and wide. These may be said to be the periods when the solid earth is thrilled through to vast distances from the centre of initial action. That this seismic energy in any way affects remote mining operations is a question only to be determined by future observation, spread over succeeding years, and there is no doubt but that patient investigation will be given to the subject. But, though we be affected, or not affected, by annual vibratory action and hurricane, it is still best for us, and the only true approach to safety, to keep our collieries surcharged with such supplies of air as will "mix up with and render harmless" any amount of gases that may be met with from any cause or influence, whether inherent in the coal, or in the locality of the mine, or even in consequence of disturbances as far distant as the tropical belt itself.

Explosions of gas or fire damp have been promoted, Mr. HIGSON states, by the ignorant and incautious use of gunpowder below ground, by stinted or too little inspection of the working and other places before firing shots, and in having large quantities of gunpowder in the mine. Great loss of life has been the result of the men themselves neglecting to fix adequate supports for the roof and sides; of running trains and tubs at an

unnecessary pace, regardless of persons being in the way, of travelling on engine and self-acting planes when the machinery was in motion; of approaching the eye and sides of the pit incautiously; of attempting to extinguish standing fires in mines with water; and of carelessly riding up and down the pit or shaft, and getting in and out of the cage. From these causes 101 fatal accidents have happened, and 234 persons have been killed within the year.

SUDDEN OUTBURSTS OF GAS.—The cause of an explosion is often said to have been the result of an outburst of gas. During an extensive practice of nearly forty years Mr. Higson has not known many such occurrences, and he is of opinion that they are few and far between. Explosions take place, as a rule, from neglecting to observe the regulations, and by firing shots (blasting) in a vitiated atmosphere, or near a quantity of impounded or accumulated gas, which becomes ignited by the flame. Shots frequently blow out, particularly when the resistance has not been lessened by cutting or nicking the side, and produce great flame. He has known the flame of a blown-out shot extend eighty yards from the shot hole. Such extent of flame would ignite gas in an adjoining place, and, perhaps, the refraction would liberate it from its confinement. He has not been able to attribute the cause of some of the explosions of the year to anything but the absence of ordinary precaution, and it is much to be regretter that the parties blamable escaped by the loss of their lives legal punishment. It must, nevertheless, be acknowledged that their conduct had the justification of general practice in the district.

Boiler Incrustation.

Incrustation is injurious in three distinct ways: It increases the consumption of fuel, injures the boiler, and may even compromise in safety. Incrustation less than one eighth of an inch thick, allow the passage of only one quater of the heat it would if the plate were clean.

One way in which incrustation injures the boiler is by its requiring the fires to be forced, thereby furthering the oxidation, diminishing the strength, and tending to tear away the plates of the boiler. The very cleaning of the boiler tends to injure the plates and structure. At the same time, there is no doubt that a thin incrustation protects the surfaces of the plates against corrosion, and that it often closes up the joints and prevents escapes.

To prevent evil effects from incrustation, the water can be purified before being fed in, or different apparatus, applied inside the boiler, can be used for the purpose. Before feeding it in, water can thus be purified by heating; or it can be distilled by using the condensed steam as feed water. In the case of the presence in the water of carbonate of lime, held slightly in solution in the form of bicarbonate, the state of solution being aided by the presence of a slight excess of carbonic acid, by saturating, by means of a sufficient quantity of lime, the excess of carbonic acid, the greater portion of the neutral carbonate will be deposited on account of the very slight solubility of that salt.

The processes employed within the boiler consist in blowing out; mixing the water with substances modifying the incrustations either chemically or mechanically; employing the circulation of the water for extracting the matters in suspension, and applying electricity against the incrustations. Marine boilers are continually blown out. In France very good results in preventing solidification have been obtained by the use of logwood shavings. The steam, though the boiler does not prime, is of a violet color; no doubt from its taking up a little water.—*Exchange.*

Remarkable Engineering Feat.—The change of grade in Fifth avenue, between Sixty-eighth and Sixty-second streets, has rendered it necessary to lower the large pipes which supply the Croton water to the lower part of the city. At the same time it was most desirable that the flow of water should not be interfered with. A bed was therefore prepared for the pipes, by direction of the Commissioner of Public Works, as a temporary resting place on the west side of the avenue, and into this bed the Croton mains, each 1000 feet in length, were shifted by means of wooden blocks. The weight of the pipes, including the water they contain, is about 1,500 pounds a foot, and this fact will give some idea of the magnitude of the task. The engineers are now lowering the pipes into the new trench which have been cut for them through the solid rock, at a depth of four feet. The pipes were laid down thirty years ago, and are found to be very little corroded.—*Evening Post.*

Practical Management of Gas Works.

By JAMES R. SMEDBERG.

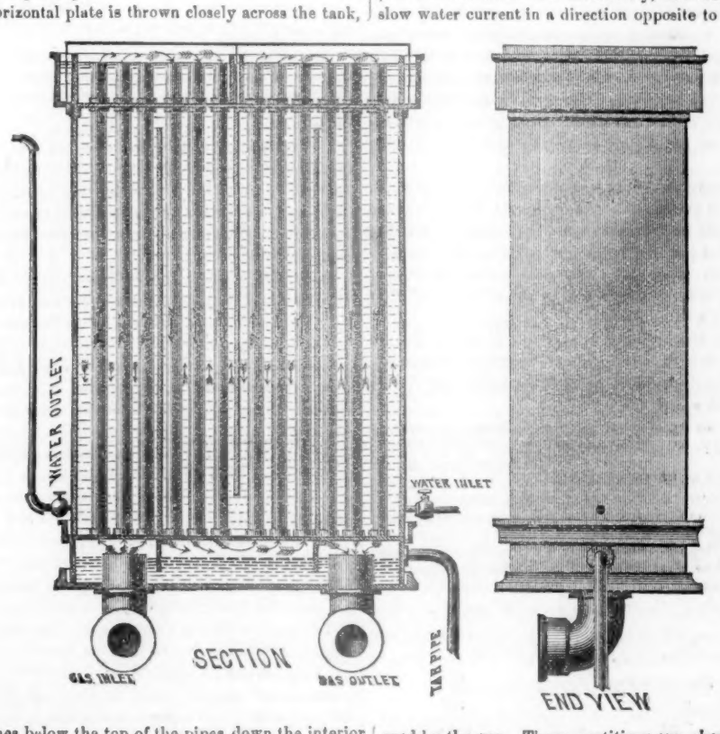
[Written expressly for this Journal.]

NUMBER IX.

Herewith is a cut of a Multitubular Condenser fitted with the tar-shelf previously mentioned. The drawing represents a condenser containing four stacks of 18 tubes each, 10 feet long over all. They are immersed for a length of nine feet, while the remaining one foot stands above the tar shelf. The tubes are of wrought iron, four inches in internal diameter, while the inlet and outlet pipes are 12 inches. The condensing surface is $72 \times 9 \times 1.78 = 763$ square feet.

According to Clegg, this surface, if in air, would have a condensing power of $\frac{763 \times 1.000 \times 24}{150} = 122.080$ cubic feet per day.

A horizontal plate is thrown closely across the tank,



12 inches below the top of the pipes, down the interior of which the tar condensed under the covers trickles into the lower box. The tubes are arranged in comparatively few conducting systems, since here, as in lime purification, a retarded gas-speed is desirable. The velocity of the gas in the 12-inch connections is 427 lineal feet per minute, and only 200 lineal feet per minute through the tubes, when in full work.

The hardest duty of a condenser is not the reduction of gas-temperature, but the precipitation to the liquid form, and subsequent separation, of the vapors of water and coal tar carried mechanically by the crude gas. The latent heat of these vapors is enormous, and they are but slowly discarded by gas while in rapid motion. Hence, I am positively certain that it would be well to carry the gas from the hydraulic main through one or more vessels of large cross-section (which I propose to call "separaters") before reaching the condensers, instead of observing Clegg's purely arbitrary rule of 10 feet intermediate run for every inch of the pipe's diameter. I speak from personal experiment in saying that this last method, so long and blindly followed, is next to worthless.

If we pass, for instance, 11,000 cubic feet per hour successively through two separators, whose interior dimensions are a cube of 10 feet for each, we slow down the gas to a velocity of less than two lineal feet per minute during 11 minutes; time ample to enable the vapors to liquify and disentangle themselves, instead of running on to embarrass the condenser. Let us make the condenser a cautionary supplement to the separator, just as the washer is now a cautionary supplement to the condenser.

This is directly counter to Bowditch, who counsels "Fractional Condensation," that is to say, a red-hot hydraulic main, from which the temperature is to dwindle through all our forms of apparatus down to a comfortable tepedity of 90 deg. at the station meter. This salamander in orders pants to work his purifiers at 350 deg. F., and may be found, encircled by his whimsies, in a book which is very fairly printed, entitled "The Analysis, Technical Valuation, Purification, and use of Coal Gas."

To render the action of the water in the immersing tank complete is usually important, and becomes doubly so where the gas-maker has to pay by quantity for what is used. Hence it is advisable to erect vertical partitions, stopped a little short of the top and bottom plates of the water-tank alternately, and thus create a slow water current in a direction opposite to that pursued by the gas. These partitions are shown in the illustration.

Thus the gas will pass out at the temperature of the inflowing water, the quantity of which may be reduced until it passes out at the temperature of the gas inlet; and so we have a theoretically perfect condenser. Without the vertical positions this is impossible.

The interior pressure at the bottom of the tank when it is full, will be nearly 700 lbs. per square foot—no small figure when their side plates of large area are used without stays, and here is a new and manifest advantage of transverse diaphragms bolted hard and fast to the former.

Wrought iron tubing is to be preferred, for the three following reasons:

1st. The tubes weigh, in the above condenser, 4,550 lbs. less than if of cast iron.

2nd. They are thinner, and therefore transmit heat more readily.

3rd. Wrought iron conducts heat better than cast (there being more carbon in the latter), in the proportion of 436 to 359, the unit being 1000.

In the case of the second advantage, I am unable to give any exact rule. Despretz has verified the following law:

> *"If the distances from the source of heat increase in arithmetical progressions, the excess of temperature over that of the surrounding air decreases in geometric progression."*

This *by itself* proves that the thickness of the pipe is

not very important, but the law only prevails in the case of very good conductors, such as gold, platinum, silver, and copper; it is only approximately true for iron, zinc, lead, and tin. Copper would, of course, be theoretically better, but the gas would act upon it to form ammoniuret and acetylide of copper, and soon eat it up.

A minor advantage of wrought tubing is that for equal gas-ways, it only occupies 85 per cent of the room of cast pipes: but this is balanced by the fact that it is smoother and does not radiate quite so well.

It is a pity we could not use rock-salt, through which heat passes as light passes through glass—or plate-glass, which is almost as diathermanous; but I don't see precisely how it can be done.

An independent water-lute is to be preferred on account of its cleanliness. Clegg specifies 150 sq. feet of surface for an hourly make of 1000 cubic feet, or 6¼ square feet per 1000 cubic feet per day.

D'Hurcourt says: "Builders of gas works adjust the exterior condensing surface in the proportion of one square metre to each cubic metre of hourly flow." This is equal to one square foot for each 3.28 cubic feet per hour, or 12½ square feet per 1000 cubic feet per day. Kirkham's Annular Condenser has a power of 1000 cubic feet per day for each six square feet of condensing surface.

The above are for Atmospheric Condensers, of which the last is perhaps the best type; but in deducing the proportions we must take the French proportion of 12½ square feet per 1000 cubic feet per day, as it refers to a structure more nearly analogous to immersed tubes. The only difference is that they stand in a bath of air instead of a bath of water.

I have often wondered at the enormous difference between Clegg's quotation of Peclet's table, and any reasonable doctrine of geometric progression. (Vide Clegg, 4th ed., p. 171.)

The quantity of heat lost when plunged in water is as quoted:

For an excess of 10 deg.	88
" " 20 "	266
" " 30 "	5353 (!!!)

D'Hurcourt gives the same absurd proportion (page 274) and so does every author, so far as I am aware, who has quoted it.

But D'Hurcourt fortunately gives also (pp. 272-3) Peclet's formula itself, according to which Clegg's proportionate table must be altered to:

For an excess of 30 deg.	535
" " 40 "	894
" " 50 "	1344

In French works on heat, the thermal unit (caloric) is the quantity of heat necessary to heat one kilogramme (2.2 lbs.) of water 1 deg. C. (1.8 deg. F.)

The *thermal unit* I propose to observe in this series is the heat required to raise 1 lb. of water 1 deg. F., or equal to $\frac{1}{3.96}$ French *calories*.

Letting Q represent the number of *calories*, and
" t " the excess of temperature,
D'Hurcourt gives Peclet's formulas thus:

Radiatingin air, $Q = 8\ [t + .0066\ t^2]$
Immersed in water, $Q = 43\ [t + .105\ t^2]$

This is for the radiation from a square metre (10.76 square feet).

D'Hurcourt then proceeds to calculate his *calories*, and gets on nicely with his excesses for 10 deg. and 20 deg., but when he comes to those for 30 deg., 40 deg., and 50 deg. respectively, *he puts his decimal point an eighth of an inch too far to the right*, and Clegg solemnly copies him, and we unfortunately swallow the statement that a surface gives off in water 153 times as much heat for an excess of 50 deg. as it does for an excess of 10 deg. Oh, Moses!

To find the *thermal units* given out by a *square foot* of surface, the above formula become

Radiating in air, $Q = 2.94\ [t + .0066\ t^2]$
Immersed in water, $Q = 15.83\ [t + .105\ t^2]$

and the table, anglicised and corrected, is

Excess of Temp.	Thermal Units Given off per Sq. Ft. Radiating in Air.	Immersed in Water.
10°	31	325
20°	66	981
30°	105	1971
40°	149	3292
50°	196	4937

The mean radiation in water, in losing 50 deg. is

$$\frac{0+325+981+1971+3292+4937}{6} = 1916 \text{ Ther. units.}$$

The radiation, *under the most favorable circumstances*, in air is — 196 Ther. units, and we are consequently forced to the conclusion that an immersed condenser requires only one-tenth the surface of one standing in air, where the velocities are equal. We desire, then, one tenth of the surface given by French constructors, or 1¼ square feet per 1000 cub. feet passing per day. Expressing it simply, and adding a margin of 20 per cent, we have the following

RULE.—IN AN IMMERSED CONDENSER, THE EXTERIOR SURFACE OF THE TUBES SHOULD HAVE AN AGGREGATE AREA OF 15 SQUARE FEET FOR EACH TON OF COAL DISTILLED PER DIEM.

This calls for 12 running feet of 4 inch pipe for every ten distilled, but it is not safe to venture on such economy of construction, unless the tar shelf and vertical divisions are adopted. They should be so divided into a single multitubular duct as to keep the velocity at or below 200 feet per minute.

With this velocity, the condenser shown will pass 482,400 cubic feet per diem; while its surface is sufficient for a daily make of 506,000 cub. feet per diem.

It is only after close study that I claim such a very great superiority for this form of condenser; and I shall not be surprised if my position is vigorously attacked. In all the other books on gas-lighting are vague generalities on the subject of condensation, but only in D'Hurcourt are any such things as mathematics or logic. And D'Hurcourt's book is in French, so that I doubt whether half of my readers have as much as heard of it.

After a somewhat lengthy, but very interesting investigation, this writer recommends 24 running feet of pipe, 3½ inches in the bore, for every two tons distilled; the ton yield being, however, 8472 cubic feet, instead of 10,000 cubic feet, as I estimate it. The letter would require 28 1-3d running feet for the 20,000 cubic feet, or 13 square feet for the daily ton.

The water required would be about 21 gallons per 1000 cubic feet; but this amount is largely diminished by the use of the separators, as I shall endeavor to show in my next.

Since the above was written, I have found Mr. Trumbore's illustrated circular, explaining a precisely similar instrument to the Exhaust Governor; and have also received a letter from Mr. William Farmer, stating that the upper plate has been applied to the Manhattan Condensers.

Anything like originality of device cannot be claimed here, and it is to be regretted that I made the mistake, however cheerfully I correct it now.

I would request any engineers who are using devices new, or believed to be new, to place themselves in communication with me on the subject. While errors will be eliminated from the series of articles prior to their publication in book form, it is better that they should not occur at all.

Kansas coal, it is said, furnishes more illuminating gas than that from Missouri, and the superintendent of the gas company at Lawrence asserts that the Scott coal, which per pound yields four cubic feet of gas, is really cheaper than Pittsburgh coal, in consequence of the saving in freight. The Kansas coals from other localities are not so rich, the highest 2.6 cubic feet of gas per pound, and the lowest 2.4 cubic feet. The Missouri coal varies from 2.4 to 2.6 cubic feet per pound.

The Chemical History of a Candle.

BY PROFESSOR FARADAY.

[A course of Six Lectures delivered before the ROYAL INSTITUTION of Great Britain.]

LECTURE IV.

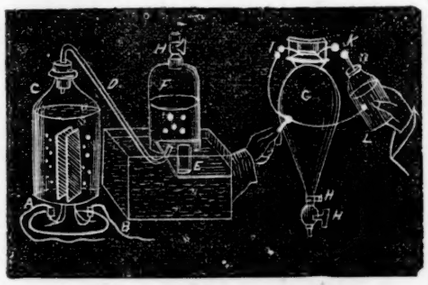
PRODUCTS: WATER FROM THE COMBUSTION—NATURE OF WATER—A COMPOUND—HYDROGEN.

I see you are not tired of the candle yet, or I am sure you would not be interested in the subject in the way you are. When our candle was burning we found it produced water exactly like the water we have around us; and by further examination of this water we found in it that curious body, hydrogen—that light substance of which there is some in this jar. We afterward saw the burning powers of that hydrogen, and that it produced water. And I think I introduced to your notice an apparatus which I very briefly said was an arrangement of chemical force, or power, or energy so adjusted as to convey its power to us in these wires; and I said I should use that force to pull the water to pieces, to see what else there was in the water besides hydrogen; because, you remember, when we passed the water through the iron tube, we by no means got the weight of water back which we put in, in the form of steam, though we had a very large quantity of gas evolved. We have now to see what is the other substance present. That you may understand the character and use of this instrument, let us make an experiment or two. Let us put together, first of all, some substances, knowing what they are, and then see what that instrument does to them. There is some copper (observe the various changes which it can undergo), and here is some nitric acid, and you will find that this, being a strong chemical agent, will act very much when I add it to the copper. It is now sending forth beautiful red vapor; but as we do not want that vapor, Mr. Anderson will hold it near the chimney for a short time, that we may have the use and beauty of the experiment without the annoyance. The copper which I have put into the flask will dissolve; it will change the acid and the water into a blue fluid containing copper and other things, and I purpose then showing you how this voltaic battery deals with it; and in the meantime we will arrange another kind of experiment for you to see what power it has. This is a substance which is to us like water—that is to say, it contains bodies which we do not know as yet, as water contains a body which we do not know as yet. Now, this solution of a salt I will put upon paper and spread about, and apply the power of the battery to it, and observe what will happen. Three or four important things will happen which we shall take advantage of. I place this wetted paper upon a sheet of tin foil, which is convenient for keeping all clean, and also for the advantageous application of the power; and this solution, you see, is not at all affected by being put upon paper or tin foil, nor by anything else I have brought in contact with it, and which, therefore, is free to us to use as regards that instrument. But first let us see that our instrument is in order. Here are our wires. Let us see whether it is the state in which it was last time. We can soon tell. As yet, when I bring them together, we have no power, because the conveyors—what we call the electrodes—the passage or ways for the electricity—are stopped; but now Mr. Anderson by that [referring to a sudden flash at the ends of the wires] has given me a telegram to say that it is ready. Before I begin our experiment I will get Mr. Anderson to break contact again at the battery behind me, and we will put a platinum wire across to connect the poles, and then if I find I can ignite a pretty good length of this wire we shall be safe in our experiment. Now you will see the power. [The connection was established and the intermediate wire became red hot.] There is the power running beautifully through the wire, which I have made thin on purpose to show you that we have those powerful forces; and now, having that power, we will proceed with it to the examination of water.

I have here two pieces of platinum, and if I lay them down upon this piece of paper [the moistened paper on the tin foil] you will see no action; and if I take them up, there is no change that you can see, but the arrangement remains just as it was before. But now see what happens; if I take these two poles and put either one or the other of them down separately on the platinum plates, they do nothing for me, both are perfectly without action; but if I let them both in contact at the same moment, see what happens [a brown spot appeared under each pole of the battery] Look here at the effect that takes place, and see how I have pulled something apart from the whit

—something brown; and I have no doubt if I were to arrange this, and were to put one of the poles to the tinfoil on the other side of the paper, why, I get such a beautiful action upon the paper, that I am going to see whether I cannot write with it—a telegram, if you please [the lecturer here traced the word "juvenile" on the paper with one of the terminal wires]. See there how beautifully we can get our results.

You see we have here drawn something, which we have not known about before, out of this solution. Let us now take that flask from Mr. Anderson's hands and see what we can draw out of that. This, you know, is a liquid which we have just made up from copper and nitric acid, whilst our other experiments were in



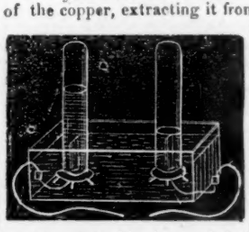
hand, and though I am making this experiment very hastily, and may bungle a little, yet I prefer to let you see what I do rather than prepare it beforehand.

Now see what happens. These two platinum plates are the two ends (or I will make them so immediately) of this apparatus; and I am about to put them in contact with that solution, just as we did a moment ago on the paper. It does not matter to us whether the solution be on the paper or whether it be in the jar, so long as we bring the ends of the apparatus to it. If I put the two platinums in by themselves, they come out as clean and as white as they go in [inserting them into the fluid without connecting them with the battery]; but when we take the power and lay that on [the paltinums were connected to the battery and again dipped into the solution] this, you see [exhibiting one of the platinums] is at once turned into copper as it were; it has become like a plate of copper; and that [exhibiting the other piece of platinum] has come out quite clean. If I take this coppered piece and change sides, the copper will leave the right-hand side and come over to the left-hand side; what was before the copp ered side comes out clean, and the plate which was clean comes out coated with copper; and you thus see that what copper we put into this solution we can also take out of it by mea s of this instrument.

Putting that solution aside, let us now see what effect this instrument will have upon water. Here are two little platinum plates which I intend to make the ends of the battery, and this, C, is a little vessel so shaped as to enable me to take it to pieces, and show you its construction. In these two cups, A and B, I pour mercury, which touches the ends of the wires connected with the platinum plates. In the vessel, C, I pour some water containing a little acid (but which is put only for the purpose of facilitating the action—it undergoes no change in the process), and connected with the top of the vessel is a bent glass tube, D, which may remind you of the pipe which was connected with the gun-barrel in our furnace experiment, and which now passes under the jar, F. I have now adjusted this apparatus, and we will proceed to affect the water in some way or other. In the other case, I sent the water through a tube which was made red hot; I am now going to pass the electricity through the inside of this vessel. Perhaps I may boil the water; if I do boil the water I shall get steam; and you know that steam condenses when it gets cold, and you will therefore see, by that, whether I do boil the water or not. Perhaps, however, I shall not boil the water, but produce some other effect. You shall have the ex periment and see. There is one wire which I will put to this side, A, and here is the other wire which I will put to the other side, B, and you will soon see whether any disturbance takes place. Here it is seeming to boil up famously; but does it boil? Let us see whether that which goes out is steam or not. I think you will soon see the jar, F, will be filled with vapor, if that which rises from the water is steam. But can it be steam? Why, certainly not; because there it remains, you see, unchanged. There it is, standing over the water, and it therefore cannot be steam, but must be a permanent gas of some sort. What is it? Is it hydrogen? Is it steam? Is it anything else? Well, we will examine it. If it is hydrogen it will burn. [The lecturer then ignited the gas collected, which burnt with an explosion.] It is; certainly something combustible, but not combustible in the way that hydrogen is. Hydrogen would not have given you that noise, but the color of that light when the thing did burn, was like that of hydrogen, it will, however, burn without contact with the air. That is why I have chosen this other form of apparatus for the purpose of pointing out to you what are the particular circumstances of this experiment. In place of an open vessel, I have taken one that is closed [our battery is so beautifully strong, that we are even boiling the mercury, and getting all things right—not wrong, but vigorously right]; and I am going to show you that that gas, whatever it may be, can burn without air, and in that respect differs from a candle, which cannot burn without the air. And our manner of doing that is as follows: I have here a glass vessel, G, which is fitted with two platinum wires, I K, through which I can apply electricity; and we can put the vessel on the air pump and exhaust the air, and when we have taken out the air we can bring it here and fasten it on to this jar, F, and let that gas into the vessel which was formed by the action of the voltaic battery upon the water, and which we have produced by changing the water into it—for I may go so far as this, and say we have merely, by that experiment, changed the water into that gas. We have not only altered its condition, but we have changed it really and truly into that gaseous substance; and all water is there which was decomposed by the experiment. As I screw this vessel, G H', on here, and make the tubes well connected, and when I open the stop cocks, H H H', if you watch the level of the water in F, you will see that that gas will rise. Now, I will close the stop-cocks, as I have drawn up as much as that vessel can hold, and being safely conveyed into that chamber, I will pass into it an electric spark from this Leyden jar, L, and the vessel, which is now quite clear and bright, will become dim. There will be no sound, for the vessel is strong enough to confine the explosion. [A spark was then passed through the jar, when the explosive mixture was ignited.] Did you see that brilliant light? If I again screw the vessel on to the jar, and open those stop-cocks, you will see that the gas will rise a second time. [The stop-cocks were then opened.] Those gases [referring to the gases first collected in the jar, and which had just been ignited by the electric spark] have disappeared, as you see; their place is vacant, and fresh gas has gone in. Water has been formed of them; and if we repeat our operation [repeating the last experiment], I shall have another vacancy, as you will see by that water rising. I always have an empty vessel after the explosion, because the vapor or gas into which the water has been resolved by the battery, explodes under the influence of the spark, and changes into water; and by and by you will see in this upper vessel some drops of water trickling down the sides and collecting at the bottom.

We are here dealing with water entirely, without reference to the atmosphere. The water of the candle had the atmosphere helping to produce it; but in this way it can be produced independently of the air. Water, therefore, ought to contain that other substance which the candle takes from the air, and which, combining with the hydro en, produces water.

Now you saw that one end of this battery took hold of the copper, extracting it from the vessel which contained the blue solution. It was effected by this wire; and surely we may say if the battery has such power with a metallic solution which we made and unmade, may we not think that it is possible that it can split asunder the component parts of the water, and put them into this place and that place? Suppose I take the poles—the metallic ends of this battery—and see what will happen with the water in this apparatus where we have separated the two ends far apart. I place one here (at A), and the other there (at B), and I have little shelves with holes which I can put upon each pole, and so arrange them that whatever escapes from the two ends of the battery will appear as separate gases; for you saw that the water did not become vaporous but gaseous. The wires are now in perfect and proper connection with the vessel containing the water, and you see the bubbles rising; let us collect these bubbles and see what they are. Here is a glass cylinder, O. I fill it with water and put it over one end, A, of the pile, and I will take another, H, and put it over the other end, B, of the pile. And so now we have a double apparatus, with both places delivering gas. Both these jars will fill with gas. There they go, that to the right (H) filling very rapidly; the one to the left (O) filling not so rapidly; and though I have allowed some bubbles to escape, yet still the action is going on pretty regularly, and were it not that one is rather smaller than the other, you would see that I should have twice as much in this (H) as I have in that (O.) Both these gases are colorless; they stand over the water without condensing; they are alike in all things—I mean in all *apparent* things; and we have here an opportunity of examining these bodies and seeing what they are. Their bulk is large, and we can easily apply experiments to them. I will take this jar, H, first and will ask you to be prepared to recognize hydrogen.



[To be continued.]

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—Eds.]

"Smedberg's Synopsis of British Gas-Lighting."

Messrs Editors: I see by your issue of the 2nd inst. that Mr. Smedberg has finished his compilation for the proposed "Synopsis of Britsh Gas Lighting."

This, when published, will undoubtedly be the most valuable work on the subject of gas-lighting, which has ever been issued from the American press, and will take a position alongside of Clegg, in all our technical libraries.

It is important therefore, that it be issued in a manner which will not only reflect credit on the compiler, but also on the fraternity, as well as on the publishers. To do this it should be stereotyped; the typographical work handsomely executed; paper and binding of superior quality, and the whole put before the public in the highest style of American art.

In order that this end may be accomplished, and this unearthed wealth of information may be properly presented to the gas world, it will be necessary to increase the subscription list, say to four hundred (400) copies, and starting with the present number two hundred and twenty-five (225), I am confident, by the proper exertions of Gas Engineers and Superintendants among those of their confreres in the several States who have not as yet subscribed, this number can easily be induced to take the work. It will, without doubt, be an invaluable *text book* to every member of the profession, who desires to be well informed on the important matters connected with the practical management of gas works. In this view of the case, it becomes a matter of prime importance to the *stockholders* of all gas companies, where the salary of their superintendant is not sufficient to warrant the purchase of this work, as his own personal property (which we are sorry to say, is too frequently the case), that it should be purchased by *them*, in order that he may be able to obtain from it, information which would inure to their interests, and be extremely important for his thorough instruction in all the practical duties of his profession.

Mr. Smedberg should at least come out of this matter without any pecuniary loss, which will certainly be the case, if he is compelled to put it through the press with the limited number of subscribers at present obtained. It therefore should be a matter of pride among Gas Engineers and Superintendents, that this great work of one of our most prominent American Engineers should not hang a dead weight pecuniarily on his interests and energies.

In addition to the class it is primarily intended to benefit, there will be a mass of information that will be profitable to meter manufacturers, fire brick and retort manufacturers, foundry men, and others engaged in the building of gas-holders, in furnishing gas mains, lamp posts, etc., manufacturers of service pipe and gas fixtures, and gas-fitters, who should all aid in this laudable undertaking, and assist in bringing out this important work in a manner which will reflect credit on all concerned.

Let each one of us therefore "put our shoulder to the wheel" and see to it, that the work when issued from the press, is a credit to the fraternity, and at the same time *not* a matter of pecuniary loss to the talented engineer, who by his untiring labor, has perfected this invaluable work for every member of the profession.

R.

P. S.—Would it not be well, Messrs. Editors, to publish a complete list of those who have subscribed, that the fraternity may see whom of their neighbors and friends have not subscribed, that an effort may be made to secure all the aid possible in this important undertaking.

[The list will be published in the next number of the Journal.—Eds.]

Mauch Chunk Gas Works.

Mauch Chunk, Pa., Sept, 19th, 1870.

Messrs. Editors: * * * * The Mauch Chunk Gas Works had to be built on the sloping rocks leading down into the Lehigh river, and in fact there is no room for them any where else in this Bourough, walled in as it is on all sides by steep high mountains

The company was organized, I think, late in the fall of 1854, with a capital of $23,125.60; commenced delivering gas to consumers April 26th, 1856, with but few to use it; however, the consumption gradually increased until 1862. It was then beginning to pay, when the freshet of June, 1862, came and swept the works so completely away, that there was hardly a stone left to mark the spot where they once stood. But a few of the persevering stockholders met, reorganized, and built the present works, and commenced delivering gas to the consumers October 30th of the same year. There was no dividend declared from that time until August 1869, when there was a dividend of four per cent. declared, and would have declared another dividend of six per cent. within six months thereafter, had it not been for the freshet of October 3d, 1869, which carried away nearly everything but gas house and castings inside. We have been repairing ever since, when the water is low enough to allow us to work, and will not get done before the 15th of October. We will then have a cement wall all along the front of the works, with its foundation resting on the rocks, in the bed of the river, six feet by twenty-five feet in height, which we think will protect us from all freshets in the future. Begging your pardon for troubling you with this long rigmarole of our troubles,

I remain yours truly,
W. H. Scott, Sup't.

[We publish a portion of the above letter, refering to the history of the Mauch Chunk Gas Co. as remarkable evidence of the pluck and perserverance of the stockholders of that, at precent flourishing Company. —Eds.]

The "Air in Gas" Question.

Philadelphia, September 10, 1870.

Messrs. Editors: In a gas works that has attracted my attention, it is known that under the operations of an exhauster, the make of gas, for some two or three months past, has apparently increased beyond the average production before that instrument was introduced; while, during the same time, the bills to individuals exhibit a material decline in the consumption. The increase may be attributed to prevention of escape of gas, and suction of air through the joints in the mouthpieces. It is usual to suppose that this would result in the increase of consumers' bills; and this evil of suction has been frequently charged against gas companies. But the case not being sustained here, can it be that whatever increase is due to the suction of air, is no detriment to the quality of the gas, or injury to the consumer? Although an increase is registered by the station meter, does not the gas, after coming in contact with the water in the gas holder, lose the air which it had taken up, and thus resume its natural bulk and luminosity? Yours truly, W. P. F.

[For comments on this letter see under head "Chemical Repertory," page 98.—Eds.]

About the "Synopsis."

Elizabeth, N. J., September 20, 1870.

Messrs. Editors: I see by a late number of your Journal, that Mr. Smedberg has completed the compilation of his "Synopsis of British Gas-Lighting." You will oblige me by adding my name to the list of subscribers for the work, as I am convinced, from Mr. Smedberg's well-known abilities as an engineer, that it will be a valuable addition to our few good works on Gas Engineering. Respectfully yours,

W. Henry White, Sup't.

About the "Synopsis."

Napa, Cal., September 13, 1870.

J. R. Smedberg, Esq.,

Dear Sir: I received your favor in due time, and am well satisfied by examining the Index, it must be an interesting work. Please send a copy. Direct Napa City Gas Company, C O D. Yours truly,

T. R. Parker.

A Reminder from a Subscriber to "Synopsis."

Seneca Falls, N. Y., Sept. 21, 1870.

Messrs. Editors: * * * Don't forget that I have subscribed for "Smedberg's Synopsis of British Gas-Lighting," and want it as soon as it comes out.

Yours truly,
Wm. Parrish, Sup't.

"Synopsis of British Gas-Lighting."

The following subscribers to the above work is acknowledged, making in all 232:

Edward Blakely, San Francisco Cal., 2 copies.
McNally & Hawkins, San Francisco, Cal.
John Baro, San Francisco, Cal.
Jacob Radston, San Francisco, Cal.
John G. Clarke, San Francisco, Cal.
J. H. Clark, San Francisco, Cal.
Joseph C. Duncan, San Francisco, Cal.
David Boyle, San Francisco Cal.
Hunter Morrison, San Francisco, Cal.
William L. Duncan, San Francisco, Cal.
Academy Natural Sciences, San Francisco, Cal.
T. R. Parker, Napa City Gas Co., Cal.
Ira P. Rankin, Pres. Pacific Pneumatic Gas Co., San Francisco, Cal.
Geo. W. Whitefield, care Pittsburgh Gas Co., Pittsburgh, Pa.
W. Henry White, Sup. Elizabeth Gas Co., N. J.
William Parrish, Sup. Seneca Falls Gas Co., N. Y.

Recent American Patents.

Pertaining to the Specialties of this Journal, for the two weeks ending October 1, 1870.

107 234.—Gas Burner.—A. E. Dupas, New Orleans, La.
107,262.—Apparatus for Carbureting Air and Gas.—J. B. Hyde, New York city.
107,265.—Steam Engine.—William Inglis, Bolton, and J. F. Spencer, London, England.
107,268.—Carbureting Apparatus.—M. W. Kidder, Lowell, Mass.
107,341.—Water Regulator.—G. W. Darby and A. S. Moon, Blanchester, Ohio.
107,380.—Gas Meter.—H. J. Hyams, Pittsburgh, Pa.
107,403.—Apparatus for Carbureting Air.—Henry Oertel, Memphis, Tenn.
107,426.—Water Elevator.—Bernard Vater, New York city.
107,453.—Balanced Slide Valve.—Orrin Collier and Wm. H. Masterman, Sacramento, Cal.
107,465.—Electric Gas Lighting Apparatus.—C. N. Ealer Opelousas, La.
107,514.—G. H. Lomax, Somerville, Mass.
107,540.—Safety Valve.—W. R. Reece (assignor to himself, Wm. Garrett, and Michael Moll), Tremont, Pa.
107,627.—Water Wheel.—T. H. Risdon, Mount Holley, N. J.
107,635.—Rotary Air Wheel For Gas Carbureters.—J. F. Spence, Brooklyn, N. Y., and L. D. Towsley, Newark N. J.

RECENT ENGLISH PATENTS.

[From the London Artizan, Sep. 1. 1870.]

2135.—Application of atmospheric power to locomotive and ascension machines.—W. E. Gedge.
2136.—Feed-water apparatus for steam boilers.—J. Wozniakowski.
2158.—Gas meters.—D. N. Defries.
2159.—Preservation of wood.—W. R. Lake.
2168.—Steam engines.—G. Warsop.
2169.—Horizontal steam boilers.—R. Porter and T. Lane.
2176.—Gas burners.—T. Barling.
2184.—Steam Engines.—M. Eyth.
2211.—Steam generator.—W. A. Gilbee.
2248.—Generating Gas.—A. Prince.
2261.—Water pressure machinery.—E. C. Williams.
2275.—Measuring Water.—A. W. Pocock.
2337.—Artificial fuel.—P. M. Parsons.

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A SYNOPSIS OF
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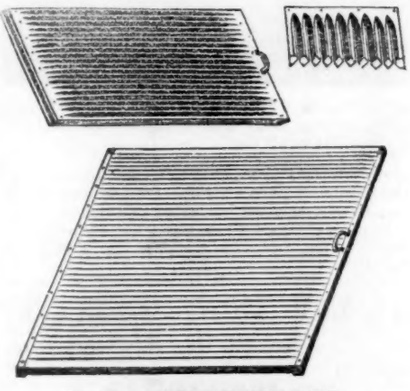

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Herring & Floyd, Oregon Iron Foundry, 738 Greenwich Street, N. Y.
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ORREL COAL COMPANY,

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It yields 10,936 cubic feet of gas to the ton of 2,240 lbs., of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.
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Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

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Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

MONDAY, OCTOBER 3, 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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GENERAL EDITORIAL.

THE INFLUENCE OF WAR UPON INVENTIONS.

The history of a people could be written from a careful study of the catalogue of inventions for any given period. Such a test would not apply to ancient history before the arts and sciences had reached their present advanced stage; but since patents have become common, and international laws have been passed in reference to them, whether a country was in a state of war or at peace with all the world, could be detected from an inspection of the inventions demanded by the wants of the time. There is no doubt that war has exercised a great influence upon inventions.

When the existence of a nation is at stake all good citizens feel called upon to put forth every effort to save it, and it is thus the inventive faculties are sharpened, and unusual applications of machinery or discoveries in science are made. During the earlier wars of Napoleon, the French navy was unable to compete with the British, and as a consequence the ports of France were blockaded. This occasioned a serious interference with many trades; the manufacturers of soap especially felt the want of soda ash, which they had been in the habit of importing from Spain. It became necessary to find some method by which this article could be manufactured from sea salt. The necessities of the French about that period produced the grand discovery of Le Blanc, of a method of making soda ash out of common salt. It was a discovery of the utmost importance, and in all its consequences has not been surpassed by any application of science to the arts that has ever been made.

During the same period of the French wars a scarcity of gunpowder called up the question of a cheap manufacture of nitre, and as a result we have nitre beds for the artificial production of the chief constituent of gunpowder. The study of how to prepare nitre beds has led to the more important research into the growth of crops, the value of nitrogeneous manure, and numerous other questions in agriculture. A very large proportion of the patents taken out during our civil war were for improvements in fire arms, or for something relating to the wants of the army. The American war involved the sending of provisions a great distance, and thus led to the method of drying and compressing many articles of food into compact packages; and out of this want has grown the large business of hermetically sealed cans and dessicated vegetables. Some of the leading inventions in the application of electricity to the explosion of torpedoes were made in the interest of war, and in times of peace we apply the principle to the work of mines, to all blasting and engineering problems, and should have great difficulty to get along without this powerful agent. To clothe and feed a vast army concentrates the talent of the best men upon the question of ways and means, and as soon as the answer is obtained for the army it applies equally well for the nation. How to transport troops and the materials of war, occasions improvements in the construction of roads and bridges and in the power to be employed for that purpose. We have as a result better engines, more compact vehicles, cheaper roads, which we obtain as a legacy from troublous times. It is a curious fact that the study of fulminates and percussion powder, without which the Needle gun would be of no avail, enables us to make cheaply the cyanides that we require in photography and electro-plating. The inventor of a certain class of fulminating powder, could hardly have anticipated to what peaceful uses his discovery would some day be applied.

Necessity is the mother of invention. Steel guns were a necessity. The Bessemer process, which met with such opposition at the start, relieved this necessity, and the Germans were among the first to profit by it, and the blast furnaces of Krupp were able to furnish the Prussian army with the finest steel cannon that had been produced in any part of the world, and when the time came for converting warlike weapons into ploughshares and pruning hooks, the same steel was employed, and it was further extended into railroad iron and all kind of machinery. It is a fortunate circumstance for Germany that the war of 1866 established the steel foundry on a sure scale, and laid the foundation for manufactures that may be the means of saving the nation, in its present emegency, from a disastrous overthrow.

Our thoughts have been led into this channel by the impending struggle between France and Prussia; the nations from whom we have received some of the most important inventions and grandest discoveries of modern times. What influence this unfortunate war may have it is impossible to predict. If it were to continue for a considerable length of time, so as to divert the studies of the scholars and practial men of both countries into devising some measures for surmounting the obstacles imposed by the war, we could not fail to hear of important discoveries. It is a severe ordeal for them to go through, and all of us would be willing to take the chances of peace for providing us with all that we require, rather than that the people of these countries should be made to suffer; but now that the war continues, it becomes an interesting question to watch for the inventions and discoveries likely to grow out of it. As nearly every able bodied man is in the army, the crops, if reaped at all, must be gathered by improved agricultural implements. The farmer must learn how to make for himself many things that he formerly obtained by exchanging the produce of his farm. Every class of society will be injuriously affected, and to keep out starvation and want will call into exercise the dormant energies and powerful intellect of both nations. It is a melancholy spectacle and fraught with serious consequences, and no possible discovery or invention can compensate for the loss of blood and treasure, that must follow in the path of such a war.

AMERICAN ENAMELLED WORK.

Beauty of finish and durability are the essential requisites of enamelled work. The enamellers of Europe and America have long been striving to arrive at perfection and to excel in the art, not only in the style and finish of the work, but in the numberless new applications of this peculiar and beautiful material.

There is a great difference in the quality and durability of enamels, and different manufactures have secrets in the process and the materials employed, which are their own peculiar property, and go far to give them a reputation, conducive to a remunerative success in the business.

CLARK'S AMERICAN ENAMEL.

An enamel that will stand a high temperature has been long sought for, but heretofore with indifferent success both in this country and in Europe. Decius W. Clark, of Chicago, Ill., has succeeded in producing an enamel of great hardness and durability, and capable of sustaining a very high temperature. This enamel is particularly valuable for chemical apparatus and retorts, etc., for gas works, and the like.

This gentleman has recently secured Letters Patent for his improved enamel, and it has been put to the most severe practical test, by several coal ga

ompanies, with the most gratifying results. The enamel is applied to the interior and exterior of gas retorts, which incorporates and fluxes with the substance of the retorts. This forms a smooth vitrified surface, which is quite indestructible at even a high white heat. It will not carbonize. It is impervious to gas, and adds greatly to the strength and life of the retort.

The important advantages of such an enamel will be readily understood by gas manufacturers and superintendents of gas works throughout the country, and will, we have no doubt, be eagerly sought for and adopted.

The inventor, who is experienced in the art, has perfected this remarkable enamel after many years' study and experimenting. He has also, we understand, perfected porcelain enamels of various and beautiful colors, having also the quality of indestructability. The uses to which these enamels can be applied are already almost numberless, and new applications are constantly being discovered. As an art, opening a new industry, the extent of which cannot be foreseen, it may be compared to the discovery and development of the art of Vulcanite, since Horace Day first discovered the peculiar effects of treating rubber with sulphur, at a high temperature.

In this connection we refer our readers to the advertisement of William H Paulding, on page 105, who is sole agent for this improved enamel.

Communications to Mr. Paulding may be addressed to the office of the "AMERICAN GAS-LIGHT JOURNAL, No. 42 Pine street, New York.

PHILADELPHIA FIRE BRICK AND CLAY RETORT WORKS.

Among the various comparatively new industries for which Philadelphia is becoming famous of late years, none, perhaps, are more important or worthy of mention, than the manufacture of fire brick, tile, clay retorts, and gas-house and retort settings; also the various kinds of work used in rolling mills, furnaces for smelting, chemical works, etc.

The "Philadelphia Fire Brick and Clay Retort Works" have gained an enviable reputation in this branch of manufactures, under the able management of Mr. John Newkumet.

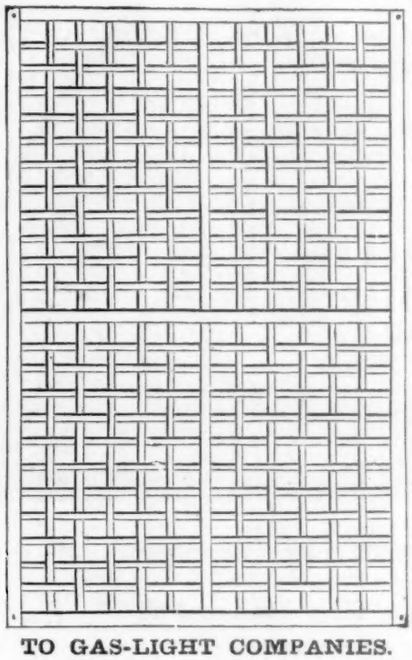
Mr. Philip Newkumet, the present proprietor of the above works, was for eight years superintendent for his brother, the late John Newkumet, and during that time had the entire manufactory under his control; he has now secured the ownership of the above works, as also the Kensington Fire Brick and Furnace Block Factory. The facilities afforded by this extensive works, together with his experience and reputation in filling all orders with only first class material, will, it is to be hoped, bring him that share of patronage which has already made his works one of the largest in the States.

The Clay Retort department is under skilful management, and plans of setting are gotten up with the greatest accuracy. Mr. Newkumet attends personally to this branch of the business. His travelling agent, who is a practical retort maker and setter, has just returned from an extended tour of the principal Gas Works of the United States, and has collected valuable information regarding the working and setting of clay retorts, with and without exhausters. Superintendents of works who do not use exhausters would do well to correspond with Mr. Newkumet, or Agent, who will be happy to furnish every information.

Mr. Newkumet has also the latgest trade in rolling mill, steel work, and iron furnace bricks and blocks in this country, and his is the only factory where a "Rolling Mill" brick is made. He owns his own clay beds, so his material is *the same* all the year round. He employs constantly upwards of 160 men, which will give an idea of the extent of his business. Consumers and others interested in this branch of industry, would do well to visit the above work, which will be not only interesting and instructive, but possibly otherwise advantageous, especially to the class first above mentioned.

We beg to refer our readers to the advertisement of Mr. Newkumet, which will be found on page 107

AMERICAN
Gas Screen Manufacturing Company,



TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the new and improved Patent GAS SCREEN, now being manufactured by the "American Gas Screen Manufacturing Company," under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other Screens now in use.

The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2nd. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3rd. The saving of lime and labor, as the screens are not liable to clog, and are easily cleaned,

4th. Their cheapness and simplicity of construction.

5th. Their *durability*—they can be used longer than any other now used.

Testimonials.

EAST BOSTON, February 22, 1870.

Mr. E. DUFFEE—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Sup't.

CHELSEA, July 20, 1870.

Mr. E. DUFFEE—Dear Sir: I have used your Purifying Trays for three years, with entire satisfaction to our company. For durability and cheapness I am convinced they are the best with which I am acquainted. By the increased purifying capacity of your Trays, it relieves the pressure on the retorts, and prevents the accumulation of carbon, and also saves lime and labor.

J. M. SOMER, Sup. Chelsea Gas Co.

DORCHESTER, March 8, 1870.

Mr. E. DUFFEE—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency.

Truly yours,
W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays I take pleasure in saying that they have been in use over two years and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

Respectfully yours,
W. H. PERRY, Superintendent.

The following Gas Companies are now using the American Gas Screen Company's Screen:

Boston Gas-Light Co., Mass.
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Newburyport Gas-Light Co., Mass.
Malden Gas-Light Co., Mass.
Webster Gas Light Co., Mass.
Dover Gas-Light Co., N. H.
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Bangor Gas-Light Co., Maine.
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The Company are now able to supply all Gas Companies with the above Screen. A trial is asked and satisfaction is guaranteed.

Address

American Gas Screen Company,
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GEORGE W. DAY, Treasurer.
LUTHER DAY, Agent.
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259-1y

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INDESTRUCTIBLE, AND WILL NOT CARBONIZE.

IMPERVIOUS TO GAS AND ADDS TO THE STRENGTH OF A RETORT.

COST MODERATE.

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WM. H. PAULDING, Sole Agent,
259-1y Office of the GAS-LIGHT JOURNAL.

FOR SALE.—A FULL SET OF RETORT House Castings for Five Benches of Threes, including everything, from Ash Pans to the Hydraulic Main; also full set of Castings for three round Purifiers, with covers, and including Wet Centre Seal.

S. F. ARNOT,
259-4t Elmira Gas-Light Co., Elmira, N. Y.

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GAS ENGINEER,
WITH MORRIS, TASKER & CO.,
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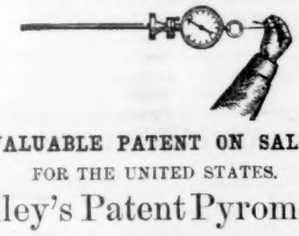
Has now in press a set of Tables, showing the flow of gas through pipes from 1-8th to 72 inches diameter, under water pressure from 1-10th to 8 inches.

Gas Engineers and Superintendents in charge of Gas Works, will be furnished with a copy, gratis, on application to the author, as above. 259



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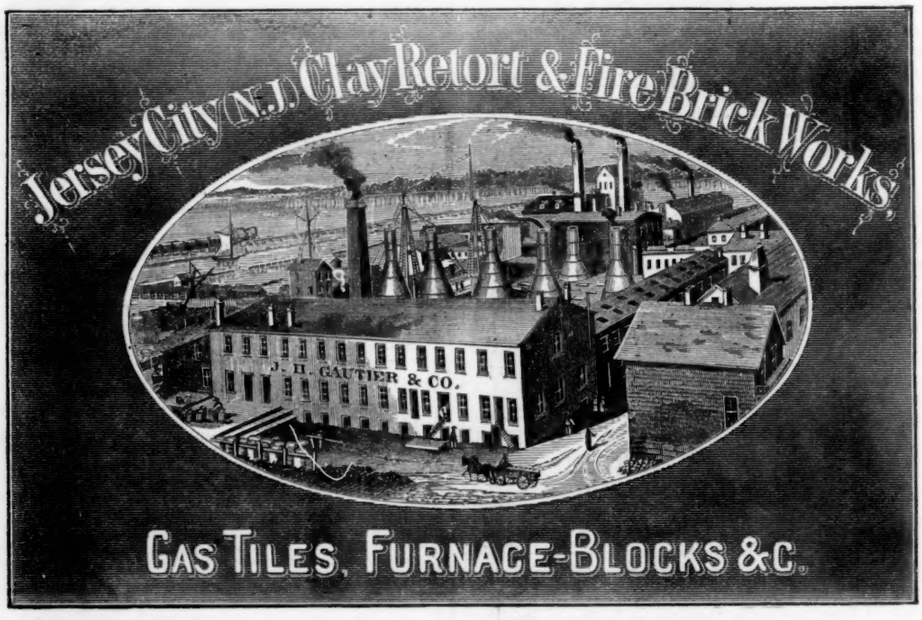
WANTED—A SITUATION AS MANAGER OF a small Works, one who understands the Gas business in all its branches—laying mains, repairing, setting and taking statement of meters. Can give first-class testimonials as to character and competency. Address, "WORKING MANAGER," GAS-LIGHT JOURNAL, 4 Pine street, Room 18, N. Y. 258



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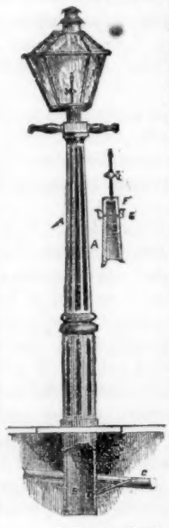

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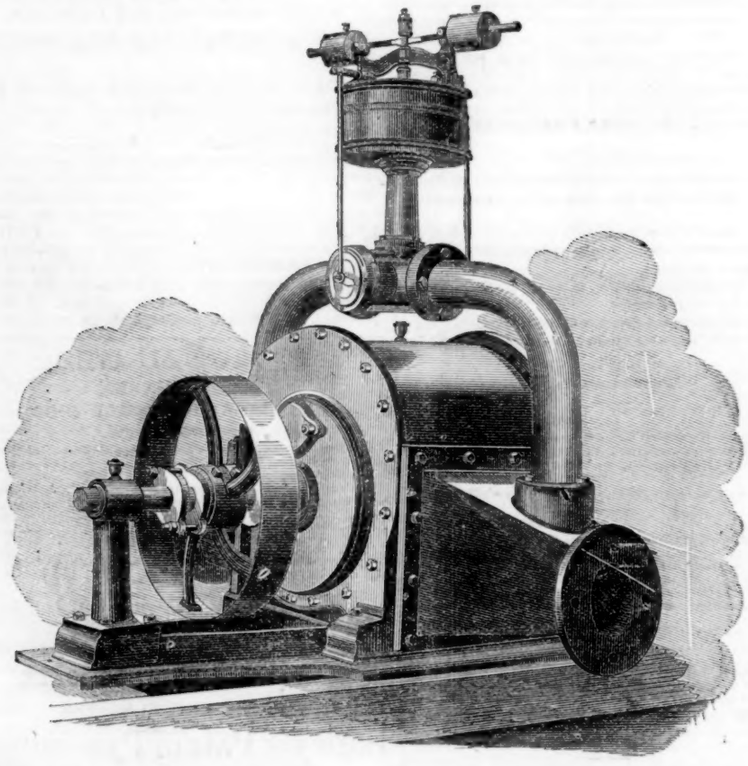

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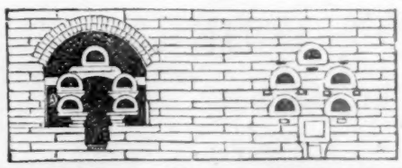

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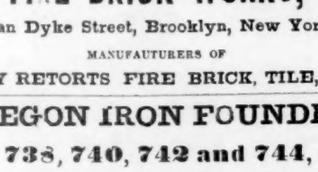

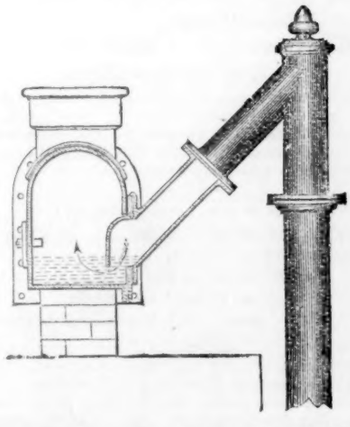

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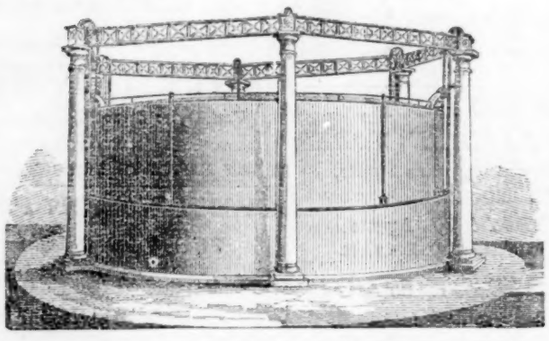

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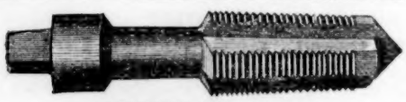

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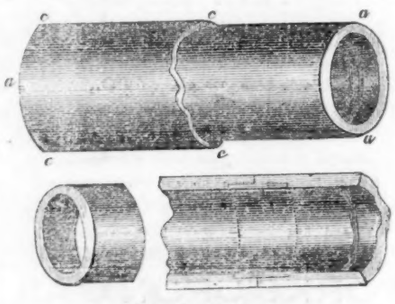

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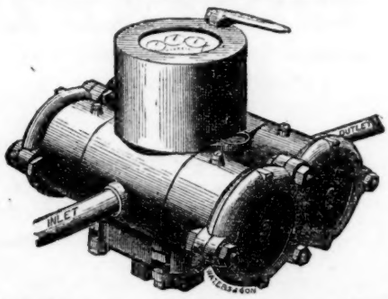

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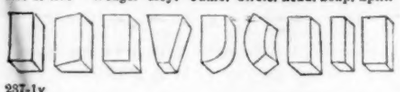

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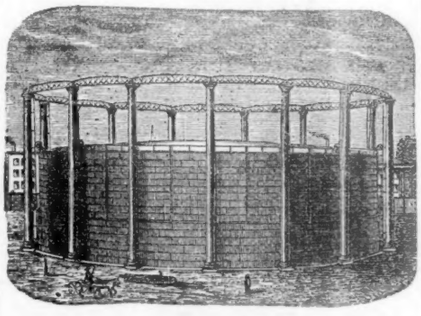

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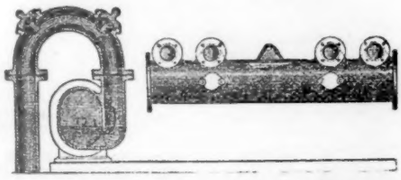

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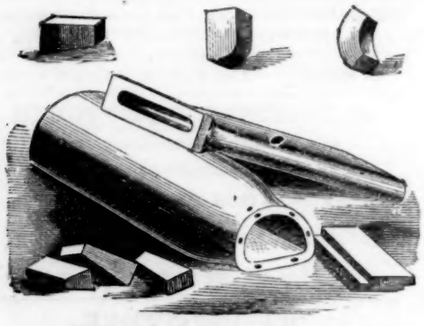

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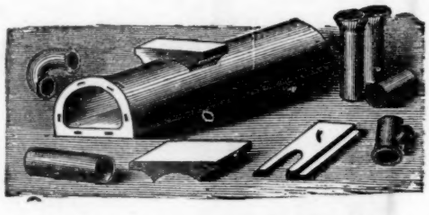

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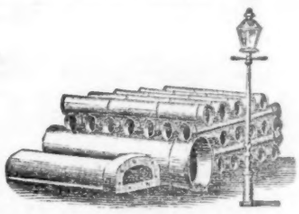

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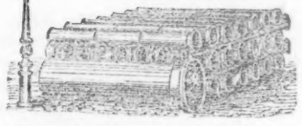

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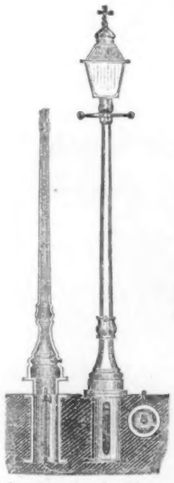

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